Terry Wallace: Protecting the globe and keeping an eye on seismicity

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Modern nuclear facilities have been designed to withstand an earthquake greater than any historic earthquake that has ever occurred within the entire state of New Mexico.

Principal Associate Director Terry Wallace, Jr. is not only the Lab's leader in global security; he's also a seismology expert who understands the importance of interpreting and responding to local geology, including what's under Los Alamos' buildings. Prior to Wallace's current role, he spent 20 years studying seismology as a professor with the University of Arizona and ran geology-related experiments in such places as Bolivia, Chile, Argentina and Venezuela. His work has earned him recognition as a leader within

the worldwide geological community, including the American Geophysical Union's prestigious Macelwane Medal, and the rare honor of having a mineral named after him by the International Mineralogical Association Commission on New Minerals, Nomenclature and Classification.

This background is highly relevant to many aspects of the Laboratory's mission, and these days in particular, an awareness of any seismic hazards that could affect the Laboratory's missions and facilities.

Like most scientific concepts, understanding earthquakes is far more complex than merely looking at a number on the Richter scale, which measures earthquake intensity. To anticipate the potential impact of seismic activity it is necessary to understand where and what types of faults might lie beneath a specific location, as well as the area's geologic composition. Seismic waves move and behave differently in materials such as sandstone or loose soil than they do within more-solid formations such as bedrock. The depth of a quake also greatly impacts the damage it can do, said Wallace. A large, deep earthquake might not even be felt by people, while a similar quake near the surface could result in considerable structural damage depending on the ground's composition and the architecture of the nearby structures.

Called hoodoos, tent rocks, fairy chimneys and earth pyramids, these natural structures provide evidence of the stability of the regional geology

When it comes to the Lab's regional history, the area is one of the best understood in the country due to the need to assess potential seismic hazards on Lab operations. In fact, said Wallace, evidence left within area geology indicates that relevant seismic activity on the Pajarito Plateau can be traced back roughly 120,000 years. This knowledge reveals that while the Lab is in proximity to the Rio Grande rift, which is slowly pulling the state apart on either side of the Rio Grande, the immediate region has remained relatively quiet in modern history, seismologically speaking anyway. Still, the Lab takes the potential of an earthquake and potential damage to its facilities seriously.

Despite a low probability of earthquake damage to key Laboratory facilities, such as those that would house nuclear materials, scenarios have been run for major earthquakes as part of the Laboratory's on-going seismic-hazards study program, which reveals that only one significant seismic event is likely to occur once every 8,000 years or so. As a result, modern nuclear facilities have been designed to withstand an

earthquake greater than any historic earthquake that has ever occurred within the entire state of New Mexico. While ensuring maximum safety, designing a building to these standards is extremely costly.

Those wondering about the seismic stability of the region can take comfort in the presence of hoodoos (also known as tent rocks or fairy chimneys) in the environs of the Pajarito Plateau. These structures, which typically balance a huge rock atop a slim spire of rock and soil, would have been toppled by a relatively mild earthquake. While the exact age of these rock spires are difficult to pinpoint, they may have existed for 10,000 years based on dating of surface weathering.

“When our Chemistry and Metallurgy Research Facility was built back in 1952, we didn’t have the understanding of seismic issues that we do now,” Wallace said. “The science has really advanced in the last 50 years. While we’re confident in our understanding of the risks, we’re also ensuring that our seismic upgrade project meets all requirements for special nuclear materials storage and handling.”

Even when Wallace isn’t helping protect the globe against nuclear and other threats, his marathoning and trail runs furthers his interest in geology due to his ability observe it during his outdoors activities.

To view Wallace’s bio, go here.

More information on the geophysics of the Rio Grande Basins from the U.S. Geological Survey.